REMARKS

Claims 60-61, 63-77, 81 and 85 are pending in the subject application. Claims 1-23, 78 and 82 have previously been canceled. Claims 42-59, 80 and 84 have been indicated to be allowable.

To further prosecuting in the subject application, Claims 24-25, 27-59, 79-80 and 83-84 have been cancelled. Remaining 60-77, 81 and 85 have been limited to the use of a naphtha feed selected from the group consisting of a light naphtha, an intermediate naphtha, a coker naphtha, a straight run naphtha, and mixtures thereof, by the herein Amendment to further prosecution in the subject application. Applicants reserves the right to file a continuing application to cover these canceled claims.

Applicants wish to thank Examiner Walter Griffin for the personal interview at the U.S. Patent and Trademark Office on September 9, 2003. During the interview Applicants presented arguments that the Sweet Patent US Patent No. 5,643,442 does not disclose (1) applicants' claimed naphtha feed, (2) applicants' claimed polyimide membrane or the use thereof to selectively separate aromatic and non-aromatic sulfur compounds from non-aromatic compounds, and (3) or the use of a polyurea-urethane membrane to selectively separate aromatic and non-aromatic sulfur compounds from non-aromatic compounds. Applicants proposed amending the claims to include sulfur amounts following the membrane treatment to clearly distinguish over the Sweet et al. reference. Applicants also argued that the claimed process distinguishes over the prior art in that the claimed process results in high olefin retention and low sulfur product having less than 100 ppm in the retentate. No agreement was reached during the interview regarding patentability.

35 USC 102 (b)

Claims 24, 36, 60 and 72 stand rejected under 35 USC 102(b) as being anticipated by Sweet et al. (US Patent 5,643,442). Claims 24 and 36 have now been canceled by the herein Amendment to the Claims. However, this rejection is traversed as it relates to remaining claims 60 and 72.

Briefly, Applicants' claims, as now amended, recite a method of lowering the sulfur content of a naphtha hydrocarbon feed containing aromatic sulfur containing compounds, non-aromatics sulfur containing compounds and olefins compounds, to a specified low sulfur concentration while simultaneously maintaining a high olefin concentration. In accordance with present invention, the method is limited to the use of a naphtha feed selected from the group consisting of a light naphtha, an intermediate naphtha, a coker naphtha, a straight run naphtha, and mixtures thereof. The naphtha feed is contacted with a polyurea-urethane membrane to separate BOTH non-aromatic compounds containing sulfur atoms and aromatic compounds containing sulfur atoms from non-aromatic hydrocarbon compounds and provide (1) a permeate fraction enriched with aromatic compounds containing sulfur and non-aromatic compounds containing sulfur and (2) a sulfur deficient, olefin rich, non-aromatic rich retentate fraction **having a sulfur content of less than 100 ppm of the sulfur and an olefin content of greater than 50 wt % of olefin compounds in the initial feed** is also provided during the membrane separation. The sulfur deficient retentate is useful in the gasoline pool without further processing. The sulfur enriched permeate fraction is thereafter subjected to a non-membrane process to reduce sulfur content and provide a reduced sulfur permeate product stream. The method of the invention is useful to provide high quality naphtha products having a reduced sulfur content and a total olefin content of at least 50 wt % of olefins present in the initial feed.

The Sweet et al. reference discloses a process for lowering the sulfur content of a distillate or hydrotreated distillate effluent hydrocarbon feed containing non-aromatics and aromatics containing nitrogen and/or sulfur atoms by contacting the feed with a **polyester-imide membrane** to selective separate a permeate fraction enriched with aromatics containing nitrogen and/or sulfur atoms from a reduced sulfur, retentate fraction enriched with non-aromatic hydrocarbons. Once treated by the membrane process the reduced sulfur retentate distillate fraction must be further processed, e.g. by fractionation, to be useful in a gasoline pool. (See Col. 1, lines 40-41).

The Sweet et al. reference is silent with respect to the reduction of the sulfur content of a **naphtha** hydrocarbon stream, in particular a naphtha hydrocarbon stream selected from the group consisting of a light naphtha, an intermediate naphtha, a coker

naphtha, a straight run naphtha, or mixtures thereof. The Sweet et al. reference is also silent with respect to using a membrane process as claimed by Applicants to provide a low sulfur, high olefin containing non-aromatic enriched naphtha fraction which is useful in a gasoline pool **without further processing**. Further, Sweet et al. also fails to teach or in any way suggest the use of a **polyurea-urethane** membrane as claimed by Applicants to selectively separate **non-aromatic compounds containing sulfur atoms** along with **aromatic compounds containing sulfur atoms** from non-aromatic hydrocarbon compounds to provide a non-aromatic rich retentate fraction having a sulfur concentration of less than 100 ppm sulfur **while maintaining a high olefin content**, i.e., at least 50 wt % of olefins in the naphtha feed, in the non-aromatic rich fraction.

Clearly, Sweet et al. is silent with respect to the amount of olefins retained in the separation fractions. Further, Sweet et al. fails to teach a sulfur concentration of **less than 100 ppm in the non-aromatic rich retentate fraction**. The only Examples disclosed in the Sweet et al. reference teaches using a **polyester-succinate membrane** to separate aromatics containing nitrogen and/or sulfur atoms from non-aromatics in a distillate feed. No reduction of sulfur below about 60 wt % in the non-aromatic rich retentate fraction is reported in the Examples. Further, there is no teaching or suggestion in Sweet et al. that any membrane other than a polyester-imide membrane separates aromatics containing sulfur atoms from non-aromatics, much less that any other membrane can selectively separate **BOTH non-aromatics containing sulfur atoms** and **aromatics containing sulfur atoms** from **non-aromatics** to provide a non-aromatic rich fraction having a sulfur content and an olefin content as claimed by Applicants.

It is also strongly maintained the Sweet et al. reference fails to disclose the use of a **polyurea-urethane membrane** to selectively separate **aromatic and non-aromatic containing sulfur compounds** from non-aromatic compounds contained in anaphtha feed. While the Sweet et al. reference teaches the use of various membranes, including a polyurea-urethane membrane, to separate **aromatics from non-aromatics**, there is clearly no teaching in the Sweet et al. reference that such membranes will also selectively separate **aromatics containing sulfur atoms** and **non-aromatics**

containing sulfur atoms from **non-aromatic components** in a naphtha feed as now claimed by Applicants while maintaining a significant olefin content.

For reasons as stated above, the Sweet et al. reference fails to anticipate Applicants' invention as claimed by failing to teach each and every element thereof. Consequently, this rejection is improper and should be withdrawn.

35 USC 103(a)

Claims 25-35, 39-41, 61-71, 75-77, 79, 81, 83, and 85 stand rejected under 35 USC 103 (a) as being obvious over U.S. Patent 5,643,442 (the Sweet et al. reference). Claims 24-35, 39-41, 79-80 and 83-84 have been canceled by the herein Amendment to the Claims. However, this rejection is respectfully traversed as it relates to remaining claims 61-71, 75-77, 81 and 85.

For reasons as stated herein above, Sweet et.al fails to render obvious Applicants' invention as now claimed. As stated herein above, the Sweet et al. reference fails to discloses or in any way teach the use of a **polyurea-urethane membrane** to selectively separate **aromatic and non-aromatic containing sulfur compounds** from non-aromatic compounds contained in a naphtha feed selected from the group consisting of a light naphtha, an intermediate naphtha, a coker naphtha, a straight run naphtha, and mixtures thereof. As stated herein above, the Sweet et al. reference discloses a process for lowering the sulfur content of a **distillate or hydrotreated distillate effluent feed** containing non-aromatics and aromatics with a polyester-imide membrane to selective separate aromatics containing nitrogen and/or sulfur atoms from non-aromatic hydrocarbons. Once treated by the membrane process the reduced sulfur retentate distillate fraction must be further processed, e.g. by fractionation, to be useful in a gasoline pool. (See Col. 1, lines 40-41).

While the Examiner has admitted that the Sweet et al reference does not disclosed Applicants' claimed feed, the Examiner has alleged that it would have been obvious to one of ordinary skill in the art to modify the process of Sweet by utilizing the claimed feeds because they are chemically and physically similar to those disclosed in Sweet.

This position is strongly traversed since the chemical composition of hydrocarbons feeds obtained from fractionation of crude petroleum will vary depending upon the boiling ranges of the feed. It clear from the attached declaration by inventor Lloyd Steven White, and at Table 8 of the attached article, W.C. Cheng et al, "Enviromental Fluid Catalytic Cracking Technology,: Catal. Rev.-Sci. Eng., 40(1& 2) 39-79(1998), that a hydrocarbon petroleum fraction will vary in the chemical composition of the sulfur compounds present in the feed. As shown in the declaration, light and intermediate naphtha feeds will contain predominately one ring aromatic and non-aromatic sulfur compounds, while distillates as described in the Sweet et al. reference contain two rings and higher alklyl two rings sulfur compounds, such as benzothiophenes and alkyl benzothiophenes.. The declaration goes on to explain that even though a naphtha sample truly cut at or below 220°C will contain substantially no benzothiophenes, actual heavy naphtha samples can and typically do tail into higher temperature and therefore some benzothiophene and alkylbezothiopheses can be present in heavy naphtha samples. Consequently, since it is clear that hydrocarbon petroleum fractions have a different chemical composition, it would not be obvious based on the teaching of the Sweet et al. reference that a naphtha feed would be useful in the pervaporation process as described by Sweet et al.

This position is especially held in view of the fact that it is known in the art that permeation of compounds through pervaporation membranes depend on their chemical structures. Further, the declaration submitted by Applicants has clearly shown that a polyurea-urethane membrane is not effective under pervaporations conditions to remove sulfur from an HCN (heavy cat naphtha) to obtain a sulfur concentration as required by applicant. Note that Applicants has shown that an HCN may contain sulfur species present in distillates, e.g. benzothiophenes.

For reasons as stated herein above, Applicants' process is unobvious over the invention as taught in the Sweet et al. reference. Withdrawal of this rejection is therefore respectfully requested.

Claims 37 and 73 stand rejected under 35 USC 103(a) as being obvious over U.S. Patent No. 5,643,422 (the Sweet et al. reference) in view of U.S. Patent 6,274,533 (the Khare patent).

For reasons as stated herein above, Applicants' process is unobvious over the invention as taught in the Sweet et al. reference. The Khare patent does not cure the deficiencies of the Sweet et al. reference so as to render Applicants' invention obvious.

The Khare patent is relied upon by the Examiner to show that it would be obvious to combine an adsorption process with a membrane process as claimed by Applicants. However, the Khare patent fails to teach or in any way suggest the combination of an adsorption process with a membrane process which reduces sulfur in a specified naphtha feed using a **polyurea-urethane membrane** to separate **aromatics containing sulfur atoms** and **non-aromatics containing sulfur atoms** from non-aromatic hydrocarbons while maintaining a high olefin content to provide a non-aromatic rich retentate fraction having a sulfur content of **less than 100 ppm sulfur** and **greater than 50 wt % of olefin originally present in the naphtha feed**.

Claims 38 and 74 stand rejected under 35 USC 103(a) as being obvious over the Sweet et al. reference (U.S. Patent No. 5,643,422) in view of Podrebarac et al. (U.S. Patent No. 6,303,020).

For reasons as stated herein above, Applicants' process is inventive and unobvious over the invention as taught in the Sweet et al. reference. The Podrebarac et al. patent does not cure the deficiencies of the Sweet et al. reference so as to render Applicants' invention obvious.

The Podrebarac et al. patent is relied upon by the Examiner to show that it would be obvious to combine a catalytic distillation process with a membrane process as claimed by Applicants. However, the Podrebarac et al. patent fails to teach or in any way suggest a process combining a catalytic distillation process with a membrane process which reduces sulfur in a naphtha feed using a membrane having a sufficient flux and selectivity to separate **aromatics containing sulfur atoms** along with **non-**

aromatics containing sulfur atoms from non-aromatics while maintaining a high olefin content to provide a non-aromatic rich retentate fraction having a sulfur content of less than 100 ppm sulfur and greater than 50 wt % of olefin in the naphtha feed.

In view of the above, it is believed that Applicants' invention as now claimed is patentable over the above-mentioned reference. Accordingly, Applicants request allowance of claims 60-61, 63-77, 81 and 85 of the subject application.

Respectfully submitted,

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